SWALES AEROSPACE

CONTRACT NO.: N00173-00-C-6011
TASK NO.: 00006.036

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Process Specification for the Bonding of Photodiode Assemblies to Cesium Iodide Crystals

SAI-PROC-1229

September 3, 2003
Revision -

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5050 Powder Mill Md.

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SIGNATURE PAGE

This is a controlled document. Any changes require the approval of the Configuration Control Board.

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DOCUMENT CHANGE RECORD

REVISION	DESCRIPTION	DATE	APPROVAL
–	Initial Release		

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1 Scope

This specification establishes the process and requirements for bonding Photodiode Assemblies (PDA) to CsI (Cesium Iodide) Crystals surface using low out-gassing and optically clear non-conductive silicone adhesive.

1.1 Definitions/Acronyms

CDE	Crystal Detector Element
CsI	Cesium Iodide Crystal
PDA	Photodiode Assembly

2 Applicable Documents

The following documents form a part of this specification to the extent specified herein. If no revision is indicated, the latest issue in effect is applicable.

2.1 Government Documents

SPECIFICATION

LAT-SS-02235-02	FM CDE Acceptance Test Plan

2.2 Non-Government Documents

SWALES AEROSPACE DRAWINGS OR DOCUMENTS

SAI-PROC-1231	Process Specification for the Handling of CsI Crystals
SAI-PROC-1232	Process Specification for the Handling of Photodiode Assemblies
SAI-PROC-1233	Process Specification for the ESD Handling of CDE Parts and the Assembly
C0501	Assembly, Fixture Flight Model
C0511	Assembly, Mold & PDA
C0539	Carrier, Crystal, CDE Glast
C0550	Assembly, Work Bench
C0552	Stand, Mold Support

PROJECT DOCUMENTS

LAT-SS-01133-03	CDE Specification
LAT-SS-02235-02	CDE Acceptance Test Plan

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D2240	Identification hardness of plastics by means of Durometer

3 Requirements

3.1 Appearance

The cured bonding material shall be uniform in appearance, and clean and free of foreign materials. There shall be no excess adhesive on the outside periphery of the Photodiode Assembly (PDA) and the crystal surface. There shall be no evidence of discoloration, delamination or peeling on the bonded surfaces. The surface of the bonding shall be free of discoloration, grease, solvent films, or other contamination. 4 or more visible voids in the bond or voids larger than .080" (2mm) are grounds for rejection.

3.2 Hardness

The Type A Durometer hardness of the cured adhesive samples shall be in the range of 35-45, Shore A

3.3 Shear Strength

The shear strength of the adhesive bond shall be 9-lbf minimum as required in LAT-SS-02235-02.

3.4 Facilities

All operations herein shall be performed in a class 100,000 minimum clean room with temperature control between 68°F to 86°F (20°C to 30°C) and humidity control between 30% RH and 50% RH.

3.5 Handling/Personnel

All personnel handling the CsI Crystals shall be trained and certified to SAI-PROC-1231, Process Specification for the Handling of CsI crystals.

All personnel handing the Photodiode Assemblies shall be trained and certified to SAI-PROC-1232, Process Specification for the Handling of PDAs (Photodiode Assemblies).

All personnel handing parts within this specification shall be trained and certified to SAI-PROC-1233, Process Specification for the ESD Handling of CDE Parts and the Assembly

All personnel working to this document shall be trained and certified to this document.

3.6 General

If not in sealed containers, all un-catalyzed silicone and primer shall remain within a fume hood, which is vented outside the clean room. All un-catalyzed silicone and primer waste shall be controlled in specific closed lid waste containers.

Clothing requirements for the clean room shall be hairnet, ESD smock and shoe covers. Personnel handling hardware, and/or involved in the bonding operation must wear powder-free nitrile gloves and a beard mask.

100% Ethyl alcohol (Ethanol) is the only solvent to be used on any operations herein. 100% Ethyl alcohol (Ethanol) is the only solvent permitted within the clean room.

All non-flight items being used in the cleaning or bonding of flight hardware shall be wiped clean by the use of Ethyl alcohol soaked clean room certified wipers.

3.7 Materials

The materials shall be in accordance with the following list:

Material
Customer furnished CsI Crystals
Customer furnished PDAs
Silicone Resin, DC 93-500 (part A)
Curing agent, DC 93-500 (part B)
Primer, DC 92-023
Prepared VM 2000 protective sleeve
Ethyl Alcohol, 100%
Gloves, Nitrile, powder-free and static dissipative, "Ansell Brand TNT® Blue"
Wipes, Texwipe TX1004
Swabs, Texwipe TX-743B

3.8 Equipment

Items required for the subject processes are as follows:

- A Halogen lighted magnifier used for visual inspections
- A calibrated, laboratory centigram (0.01 gram) scale, used to measure material mixing proportions
- A vacuum chamber or bell jar capable of operating at a vacuum level of 28 in. Hg or lower, used to degas adhesives.
- Shore A Durometer
- Shear test fixture
- ESD Approved Working Bench and staging areas.

3.9 Tooling

The materials shall be in accordance with the following list:

C0501	Assembly, Fixture Flight Model
C0511	Assembly, Mold & PDA
C0539	Carrier, Crystal, CDE Glast
C0550	Assembly, Work Bench
C0552	Stand, Mold Support

4 Bonding Procedure

4.1 General

4.1.1 Description

In this bonding process, Dow Corning DC93-500 is injected into a mold assembly to bond the CsI crystal to the PDA. It is a two-day operation, where one end is bonded one day and the second end a different day. The bondline thickness of .035 in. (0.89 mm) is tool controlled.

4.1.2 Information

Traceability including orientation for the CsI crystal and both PDAs shall be maintained throughout the entire process. The traceability shall be maintained on the work instructions.

As received, the crystal identification number is affixed only on the outside of the Aluminum foil/Tyvek wrapper. The crystal has a small, "V" arrow scribed in it near and pointing toward the right face. There is no other identification on the CsI crystal and no orientation marking other than the "V". This "V" arrow provides a reference orientation for all-further crystal processing. See Figure 1 for references.

The "V" face is defined as the Top face of the crystal. The face opposite the V is the Bottom face. The end face nearest the V is defined as the Right or Plus face. The end face far from the V is the Left or Minus face. With the V at the Top and Right, the Front face is the 19.9 mm x 326 mm face toward the technician, and the Rear face is the opposite 19.9 mm x 326 mm face.

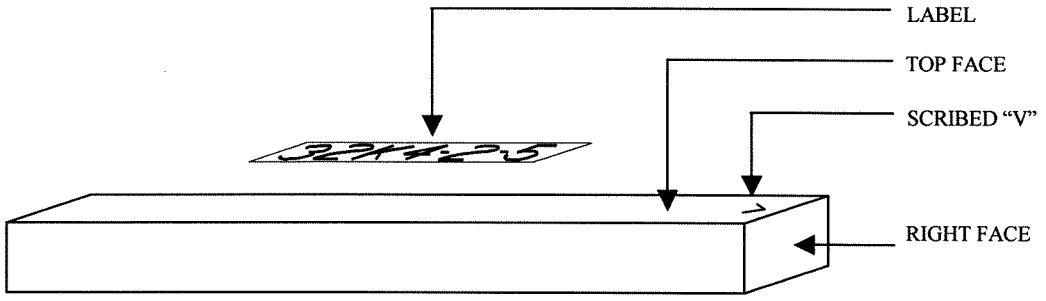

Figure 1: Crystal Labeling and Orientation Detail

4.2 Setting Up the Crystal within the Support Channel

4.2.1 Crystal Preparation

1. Obtain a prepared non-flight VM2000 film sleeve that is approximately 9½ in. long and label it with the crystal serial number and assigned tool number. The label shall be centered on the top face ("V" scribed face). The label shall be Kapton tape and "Sharpie". Reference the work instructions for the crystal to tool number relationship.
2. Place the crystal within the crystal carrier tool (C0539).
3. Slide the crystal out of its protective Tyvek sleeve, onto and within the crystal carrier.
4. Slide the previously identified protective sleeve over the crystal so that the crystal is protected throughout the entire bonding process. Center the sleeve and verify the relationship of the identification with the inscribed "V".
5. The crystal is now ready for assembly into the support channel.

4.2.2 Set-up

1. Create the crystal's bonding set-up as follows:
    a. Fasten the backstop (C0516) to the support channel (C0502), to the end opposite the "V" stamped on the support channel, using screws and washers. Verify the hardware is tight.
    b. Retract all the thumbscrews to their "full open" position to prepare for the crystal's placement into the bonding set-up.
    c. The crystal shall be oriented in the support channel such that inscribed "V" in the crystal is related to the inscribed "V" on the support channel. Insert the crystal into the support channel. Rest the crystal against the perpendicular fixed pads located in both ends of the channel and bottoming-out at against the backstop.

CAUTION: The adjustable thumbscrews in the assembly are intended to help support the crystal in the channel only. Do not over torque the thumbscrews to clamp the crystal in place else the crystal may be damaged.

    d. Obtain 3 retainer/thumbscrew assemblies (C0505) and retract the thumbscrews to the "full open" position. Fasten the assemblies to the support channel and verify the hardware is tight.
    e. While observing the crystal from the top face of the channel, adjust the two side thumbscrews; across from the two fixed pads until the swivel pads **lightly** touch the crystal. Verify that the protective wrap is clear of the hard points.
    f. Adjust the two top thumbscrews; across from the two fixed pads until the swivel pads **lightly** touch the crystal. The crystal should now be "towed" into the "hard point corner" and against the backstop. The Bottom and Front faces shall now be in contact with the "hard points".
    g. Tighten the 4 remaining thumbscrews about the center of the crystal, until they **lightly** touch the crystal.

2. With the crystal securely held within the support channel, vertically mount the set-up onto the workbench. Note that the end of the CDE that is to be bonded is located in the top position of the set-up. Tighten the hardware that holds the support channel to the workbench.
3. The crystal shall be re-aligned in the vertical position. Slightly loosen all the thumbscrews. Re-tighten the thumbscrews in the following order:
    a. The 2 opposite the side hard points
    b. The 2 opposite the bottom channel hard points
    c. The 2 side thumbscrews about the center of the crystal
    d. The top and bottom thumbscrews about the center of the crystal
4. The crystal in now in position and ready for a final cleaning prior to priming.

4.2.3 Cleaning and Priming the Crystal Bonding Surface

1. Solvent wipe clean the crystal end, using ethanol and TX 1004 clean-room wipes. Allow the surface to air dry for 10 minutes minimum before continuing.
2. Priming shall occur within 4 hours of cleaning.
3. Fill an approved Polypropylene micropipette with primer DC92-023.
4. Deliver 10μL of primer near the center of the crystal bond surface. Touch the tip of the dispenser to the crystal surface to ensure that the full amount is delivered.
5. If the primer does not wet the entire surface, spread the primer evenly over the bonding surface by using the blade of a polypropylene spatula.
6. Allow the primer to air dry on the crystal for 90-180 minutes at room temperature and acceptable humidity conditions. Do not cover the primed face of the crystal until this drying period is complete.
7. Perform a visual verification of the crystal surface. The bonding surfaces should be visibly clean and contain a thin coat of primer.

4.3 Set-up of Mold & PDA Assembly

4.3.1 Set-up of PDA into First Side (Reference Side) of Mold

1. The PDA is ESD sensitive. Assembly of the PDA shall be confined to an ESD grounded surface.
2. The PDA is to be handled by the ceramic carrier only. Do not touch the clear optical window, even with gloves. The PDA shall be bonded within 4 hours from the time it was removed from its' sealed bag.
3. There is no surface preparation of the PDA. The PDA does **not** get primed.
4. Place the PDA on a clean surface (either Kapton or Llumalloy) optical window down. Using a approximately 1/8" diameter pin to control the bend radius of the wires, bend the wires 90 degrees up at the wire/carrier/staking compound intersection.

5. Create the first half of the Mold/PDA assembly (C0511) as follows:
    a. Obtain all the parts listed on the C0511 Bill of Materials and the Mold Support Stand (C0552). The mold must have been previously mold released and buffed prior to use.
    b. Slide the reference side of the mold, over the support stand pins with the fill side down.
    c. Place the chamfered seal (with hole), chamfered mask (with slot) and chamfered clamp into the pocket of the mold. They must be in the proper sequence; seal (with hole) then mask (with slot) then clamp.
    d. Lightly fasten the clamp to the mold with 4 screws and washers.
    e. Slip the PDA between the seal and mold. While pushing the PDA against the reference edge, torque the 4 screws to 4.5 in-lb.
    f. Install the 2 pin bolts/washers/jam nuts into the side of the mold. The first half is now complete.

4.3.2 Set-up of PDA into Second Side of Mold

1. Create the second half of the Mold/PDA assembly (C0511) as follows:
    a. Slide the second half of the mold over the pin bolts. Lightly tighten the nuts onto the pin bolts.
    b. Place the seal (with hole), mask (with slot) and clamp into the pocket of the mold. They must be in the proper sequence; seal (with hole) then mask (with slot) then clamp.
    c. Lightly fasten the clamp to the mold with 4 screws and washers then torque the 4 screws to 4.5 in-lb.
    d. Tighten the pin bolts such that the mold halves contact each other on the fill side, the seals touch (lightly compress) and a tapered mold seam exists. Do not close the seam a taper condition must remain.

4.3.3 Fasten Wire Holder in Place

1. Slide the wires thru the wire holder (C0540). Fasten the wire holder to the mold assembly, using only one screw, to the reference side of the mold.
2. Visually verify the assembly to ensure that the diode, mask and seal are resting in the mold properly and that there are no gaps or over lapping of any kind between the mold, mask and seal since this will compromise the seal and can potentially cause leakage.
3. Move the mold assembly to the pre-assigned workbench station number. Place the mold-PDA assembly, wires down, within the C-channel on top of the workbench, in-line with the assembly to which it will be bonded. Reference the work instructions for the PDA to tool number relationship.

4.3.4 Assemble the mold/PDA assembly to the support channel as follows:

1. Slip a pair of Ø.125" dowel pins into the support channel holes.
2. Slide the mold/PDA assembly down over the dowel pins.
3. Preload the crystal to create a tight seal at the bonding surface by using four compression springs, #¼-20 shoulder bolts and washers. Tighten the four bolts until they bottom-out at the top surface of the channel.
4. The crystal and mold/PDA should now be ready for injection bonding.

4.4 Adhesive Mixing and Injection

4.4.1 Mixing

1. Generate a mixture of DC93-500 to the following ratio:

   DC93-500 Base (Part A 100 pbw) 40 grams

   DC93-500 Curing Agent (Part B 10 pbw) 4 grams

   Use a 400 ml polypropylene beaker to allow ample volume for degassing the mixture. Use a polypropylene pipette to deliver the curing agent. Using a cleaned polypropylene stirring-rod, thoroughly blend the adhesive in the beaker. Mix for at least three minutes.
2. Transfer the mixture into a second beaker then degas the adhesive in a vacuum until no entrapped air is visible. Pump for at least 20 minutes after the adhesive collapses (breaks). Pump for at least 5 minutes after the last visible bubble is gone. Record the duration of the degassing time in the Mix Log Sheet.
3. The pot life is from the time the curing agent was added is 1 ½ hours maximum.

4.4.2 Injection

1. Assemble a syringe with a 15-gauge needle (0.053" ID, 0.064" OD).
2. While holding the syringe at an angle with the needle pointing downward, slowly fill the syringe with the degassed DC93-500. Pour the adhesive down the side of the syringe slowly to minimize trapping air in the syringe cavity. Remove entrapped bubbles from the syringe before creating the bond.
3. Place the filled syringe into a glue gun. Adjust the gun to 25 psig pressure for injection. Be sure to keep the syringe in a vertical position with the needle end pointing downward so that bubbles are not introduced into the syringe at the needle end of the syringe.
4. Inject the DC93-500 into the mold inlet hole (witness hole side). Continue the injection process until the adhesive is visible at the outlet hole and no bubbles come out of the overflow side.
5. Using clean-room swabs and/or clean-room cloth, remove any over-flowed adhesive from the mold inlet and outlet wells.
6. Fill wells with adhesive, for easier cleaning.

7. Generate a "hockey puck" at least a ¼" thick, and a mix record sheet. Allow the bond to cure for 24 to 72 hours before disassembly.

4.5 "Day One" Bonding Disassembly Procedure

1. The following steps should be performed 24 to 72 hours after the first bond for each CDE:
    a. Relocate and re-fasten the wire holder from the mold assembly to the support channel.
    b. Remove the four #¼-20 bolts and springs that secure the mold to the support channel.
    c. Remove the pin bolts.
    d. From the front, lightly pry the two halves open about 1/16". Slowly separate and remove the half within the dowel pins.
    e. Remove the dowel pins and separate the second half.
    f. Once the mold, mask and seal are free, carefully clean the crystal surface around the bonded area with a dry clean-room swab to remove any partially cured residual adhesive.
    g. Perform a visual verification on the bonds just released from "day one" of the bonding process to ensure that bonds do not contain any voids or bubbles.
    h. Remove the bond set-up from the workbench by loosening the four screws and place the set-up on a worktable.
    i. Set all used molds, mask and seals aside for cleaning. If the mask or seal are damaged, the items shall be discarded and a new set shall be used.

4.6 Set-up and Bonding Procedure for "Day Two" End of CDE

4.6.1 Crystal Set-up

1. With the bond set-up removed from the worktable lightly loosen all thumbscrews.
2. Remove the backstop from the support channel. Slide the crystal towards the un-bonded end just enough so backstop can be slide between the support channel and wire holder. Fasten the backstop to the support channel.
3. While observing the crystal from the top face of the channel, adjust the two side thumbscrews; across from the two fixed pads until the swivel pads **lightly** touch the crystal. Verify that the protective wrap is clear of the hard points.
4. Adjust the two top thumbscrews; across from the two fixed pads until the swivel pads **lightly** touch the crystal. The crystal should now be "towed" into the "hard point corner" and against the backstop.
5. Tighten the 4 remaining thumbscrews about the center of the crystal, until they **lightly** touch the crystal.
6. With the crystal securely held within the support channel, vertically mount the set-up

onto the workbench. Note that the end of the CDE that is to be bonded is located in the top position of the set-up. Tighten the hardware that holds the support channel to the workbench.

7. The crystal shall be re-aligned in the vertical position. Slightly loosen all the thumbscrews. Re-tighten the thumbscrews in the following order:
    a. The 2 opposite the side hard points
    b. The 2 opposite the bottom channel hard points
    c. The 2 side thumbscrews about the center of the crystal
    d. The top and bottom thumbscrews about the center of the crystal
8. The crystal in now in position and ready for a final cleaning prior to priming.

4.6.2 Cleaning and Priming Bonding Surfaces

1. Solvent wipe clean the crystal end, using ethanol and TX 1004 clean-room wipes. Allow the surface to air dry for 10 minutes minimum before continuing.
2. Priming shall occur within 4 hours of cleaning.
3. Fill an approved Polypropylene micropipette with primer DC92-023.
4. Deliver 10μL of primer near the center of the crystal bond surface. Touch the tip of the needle to the crystal surface to ensure that the full amount is delivered.
5. If the primer does not wet the entire surface, spread the primer evenly over the bonding surface by using the blade of a polypropylene spatula.
6. Allow the primer to air dry on the crystal for 90-180 minutes at room temperature and acceptable humidity conditions. Do not cover the primed face of the crystal until this drying period is complete.
7. Perform a visual verification of the crystal surface. The bonding surfaces should be visibly clean and contain a thin coat of primer.

4.7 Set-up of Mold & PDA Assembly

4.7.1 Set-up of PDA into First Side (Reference Side) of Mold

1. The PDA is ESD sensitive. Assembly of the PDA shall be confined to an ESD grounded surface.
2. The PDA is to be handled by the ceramic carrier only. Do not touch the clear optical window, even with gloves. The PDA shall be bonded within 4 hours from the time it was removed from its' sealed bag.
4. There is no surface preparation of the PDA. The PDA does **not** get primed.
3. Place the PDA on a clean surface (either Kapton or Llumalloy) optical window down. Using a approximately 1/8" diameter pin to control the bend radius of the wires, bend the wires 90 degrees up at the wire/carrier/staking compound intersection.

4. Create the first half of the Mold/PDA assembly (C0511) as follows:
   a. Obtain all the parts listed on the C0511 Bill of Materials and the Mold Support Stand (C0552). The mold must have been previously mold released and buffed prior to use.
   b. Slide the reference side of the mold, over the support stand pins with the fill side down.
   c. Place the chamfered seal (with hole), chamfered mask (with slot) and chamfered clamp into the pocket of the mold. They must be in the proper sequence; seal (with hole) then mask (with slot) then clamp.
   d. Lightly fasten the clamp to the mold with 4 screws and washers.
   e. Slip the PDA between the seal and mold. While pushing the PDA against the reference edge, torque the 4 screws to 4.5 in-lb.
   f. Install the 2 pin bolts/washers/jam nuts into the side of the mold. The first half is now complete.

4.7.2 Set-up of PDA into Second Side of Mold

5. Create the second half of the Mold/PDA assembly (C0511) as follows:
   a. Slide the second half of the mold over the pin bolts. Lightly tighten the nuts/washers onto the pin bolts.
   b. Place the seal (with hole), mask (with slot) and clamp into the pocket of the mold. They must be in the proper sequence; seal (with hole) then mask (with slot) then clamp.
   c. Lightly fasten the clamp to the mold with 4 screws and washers then torque the 4 screws to 4.5 in-lb.
   d. Tighten the pin bolts such that the mold halves contact each other on the fill side, the seals touch (lightly compress) and a tapered mold seam exists. Do not close the seam a taper condition must remain.

4.7.3 Fasten Wire Holder in Place

6. Slide the wires thru the wire holder (C0540). Fasten the wire holder to the mold assembly, using only one screw, to the reference side of the mold.
7. Visually verify the assembly to ensure that the diode, mask and seal are resting in the mold properly and that there are no gaps or over lapping of any kind between the mold, mask and seal since this will compromise the seal and can potentially cause leakage.
8. Move the mold assembly to the pre-assigned workbench station number. Place the mold-PDA assembly, wires down, within the C-channel on top of the workbench, in-line with the assembly to which it will be bonded. Reference the work instructions for the PDA to tool number relationship.

4.7.4 Fastening the Mold/PDA to the Support Tool/Crystal After Primer Cure

9. Assemble the mold/PDA assembly to the support channel as follows:
    a. Slip a pair of Ø.125" dowel pins into the support channel.
    b. Slide the mold/PDA assembly down over the dowel pins.
    c. Preload the crystal to create a tight seal at the bonding surface by using four compression springs, #¼-20 shoulder bolts and washers. Tighten the four bolts until the washers bottom-out at the top surface of the counter bored holes.
    d. The crystal and mold/PDA should now be ready for injection bonding.

4.8 Adhesive Mixing and Injection

4.8.1 Adhesive Mixing

1. Generate a mixture of DC93-500 to the following ratio:

DC93-500 Base (Part A 100 pbw)	40 grams
DC93-500 Curing Agent (Part B 10 pbw)	4 grams

2. Use a 400 ml polypropylene beaker to allow ample volume for degassing the mixture. Use a polypropylene pipette to deliver the curing agent. Using a cleaned polypropylene stirring-rod, thoroughly blend the adhesive in the beaker. Mix for at least three minutes.
3. Transfer the mixture into a second beaker then degas the adhesive in a vacuum until no entrapped air is visible. Pump for at least 20 minutes after the adhesive collapses (breaks). Continue for 5 minutes after the last visible bubble. Record the duration of the degassing time in the Mix Log Sheet.
4. The pot life is from the time the curing agent was added is 1 ½ hours maximum.

4.8.2 Adhesive Injection

1. Assemble a syringe with a 15-gauge needle (0.053" ID, 0.064" OD).
2. While holding the syringe at an angle with the needle pointing downward, slowly fill the syringe with the degassed DC93-500. Pour the adhesive down the side of the syringe slowly to minimize trapping air in the syringe cavity. Remove entrapped bubbles from the syringe before creating the bond.
3. Place the filled syringe into a glue gun. Adjust the gun to 25 psig pressure for injection. Be sure to keep the syringe in a vertical position with the needle end pointing downward so that bubbles are not introduced into the syringe at the needle end of the syringe.
4. Inject the DC93-500 into the mold inlet hole (witness hole side). Continue the injection process until the adhesive is visible at the outlet hole and no bubbles come out of the overflow side.
5. Using clean-room swabs and/or clean-room cloth, remove any over-flowed adhesive from the mold inlet and outlet wells.
6. Fill wells with adhesive, for easier cleaning.

7. Generate a hockey puck and allow the bond to cure for 24 to 72 hours.

4.9 "Day Two" Bond Disassembly Procedure

4.9.1 Disassembly

1. The following steps should be performed 24 to 72 hours after the bond for each CDE:
    a. Relocate and re-fasten the wire holder from the mold assembly to the support channel.
    b. Remove the four bolts and springs which secure the mold to the support channel.
    c. Remove the pin bolts.
    d. Remove the dowel pins.
    e. From the front, lightly pry the two halves open about 1/16". Slowly separate the mold, split mask and split seal into their halves.
    f. Once the mold, mask and seal are free, carefully clean the crystal surface around the bonded area with a dry clean-room swab to remove any partially cured residual adhesive.
    g. Perform a visual verification on the bonds just released from "day one" of the bonding process to ensure that bonds do not contain any voids or bubbles.
    h. Remove the bond set-up from the workbench by loosening the four screws and place the set-up on a worktable.
    i. Set all used molds, mask and seals aside for cleaning. If the mask or seal are damaged, the items shall be discarded and a new set shall be used.
2. Remove the cable protectors and backstop.
3. Loosen all the thumbscrews, so that the crystal is free to slide along the channel's length.
4. Slide the crystal out of the support channel and onto the crystal carrier.

4.9.2 Verification and Storage

1. Perform a visual verification on the bonds just released from "day two" of the bonding process to ensure that bonds do not contain any voids or bubbles.
2. Set the bonded assembly aside in an acceptable ESD storage area and allow the bonds to reach the 7 days full cure.

5 Post Process Inspection

5.1 Hardness

The shore hardness of the sample adhesive for each mixing lot should be in the range of 35-45, Shore A.

5.2 Appearance

The surface of all adhesive bonds shall meet the following requirements:

- Shall be in a fully cured state as defined to be tack free to the touch of a plastic probe.
- Shall have good adhesion and show no evidence of separation between the PDA and the crystal.
- Should be free of particulate contamination, such as dirt, hair, dust, etc.

6 Quality Assurance Provisions

6.1 Material Control

All materials used shall have been verified versus the appropriate documentation to their correct performance via a Standard Materials Certification (SMC) or Certificate of Compliance from the manufacturer. All materials shall be within their original shelf life and stored per the manufacturer's recommendations in terms of proper containers and storage environment.

The adhesive's trade name, mix ratio, manufacturer's lot number and expiration date shall be recorded on a mix record and referenced back to the manufacturing traveler.

6.2 Personnel Certification

Trained and competent technicians as determined shall perform processing in accordance with this specification. All personnel in contact with hardware shall be trained for ESD and clean room procedures.

6.3 Sampling for Acceptance Tests

The processed parts and their associated witness hardness samples shall be used to determine compliance with requirements specified herein. Do not discard sample for hardness. Submit to QA for retention along with mix log.

6.4 Facility Approval Inspection

Facility approval inspection is performed on sample units produced with equipment and procedures normally used in production. Facility approval inspection consists of all the examinations and tests in this specification.

6.5 Quality Conformance Inspection

Quality conformance inspection consists of all the tests and examinations performed on items, which have been submitted for acceptance and specified herein. All parts shall be inspected 100 percent for all requirements except hardness. Hardness shall be inspected on specimens prepared on a lot representative basis.

6.6 Lot Formation

A lot consists of all the assemblies of the same part number, processed in a 7-day period, using the same batch of adhesive, by the same processing activity, in accordance with this specification, and submitted for inspection at one time.

7 Tests

7.1 Hardness

Prepare a specimen cure concurrently with the hardware. An aluminum-foil weighing pan makes a suitable mold. Hardness shall be measured in accordance with ASTM D2240. The final hardness shall be documented in the mixing log.

7.2 Appearance

The appearance of all bonds shall be examined with a Halogen lighted magnifier having 4-10X magnification. All bonded assemblies shall be examined for conformance to workmanship requirement defined in 3.1 and herein.

7.3 Rejection

Failure of any required test stated in this specification shall be cause for rejection.

7.4 Surveillance

The cognizant Quality Assurance activity shall provide the surveillance necessary to verify conformance to this specification and processes.

7.5 Equipment Calibration

The cognizant Quality Assurance activity shall assure that the calibration system is in accordance with MIL-STD-45662.